During the 2-hour period preceding fog the average velocity upon 2 occasions was 20 miles an hour.

Sixty-nine percent of the cases occurred with a wind velocity of 2–6 miles/hour; and 68 percent of the time in the 2-hour period preceding all fogs the wind velocity also was 2–6 miles/hour.

### HOURS OF OCCURRENCE

The mid-point of each of the 381 cases is shown on figure 5. It was found that more fogs are centered around 6 a.m. than any other hour, and that fogs to a very marked extent, tend to "cluster" around the hours 3 a.m.–6 a.m. It is significant that nearly ½ the cases fell within these limits. There is a very apparent increase for fog-centers between the hours 2 a.m. and 3 a.m., and an almost as noticeable drop in the cases of 6 a.m. and 7 a.m. Thus these data bring out very clearly that the above-mentioned hours are the ones in which fogs really tend to "cluster." This condition is very likely, at least to a large extent, owing to the fact that practically all radiational fogs are centered around these hours.

It is noted that there is an almost total absence of fogs between noon and 10 p.m. It was of course known that only relatively few fogs were centered around these hours, but the actual small number was somewhat unexpected. The vast majority of the fogs centered around

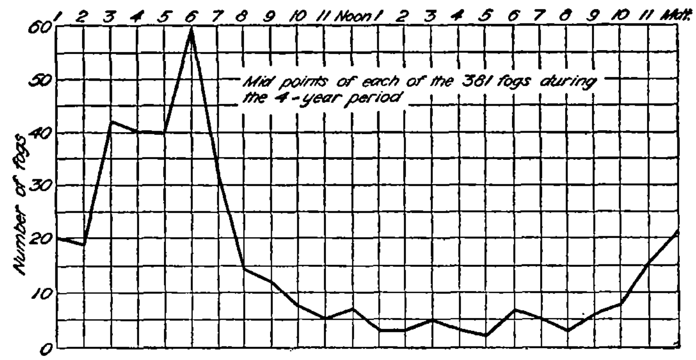


FIGURE 5.

these hours are unquestionably frontal, and occur almost entirely during the months in which this kind of fog predominates.

## DUST STORM OF APRIL 12, 1934, BATON ROUGE, LA.

By RICHARD JOEL RUSSELL and R. DANA RUSSELL

[Louisiana State University]

Residents of the "Deep South" seldom experience visibility reduced to 3 or 4 (International Scale) as the result of atmospheric dust, hence speculation was rife on April 12, 1934, when this phenomenon occurred. Throughout the day in Baton Rouge, La., though the sky was cloudless, shadows were barely discernible. Sunshine duration, as recorded on a Friez instrument, was limited to 5 hours, 12 minutes, during the middle of the day, whereas a few days earlier in the season it had amounted to as much as 10 hours, 15 minutes. Notably reduced visibilities were reported at least as far east as Atlanta, Ga. An aviator flying at an elevation of 1,000 feet in central Louisiana found visibility so poor that he ascended to 6,000 feet to avoid dust and, later, had considerable difficulty in landing at Houston, Tex. Though the intensity of the dust storm was much greater in the Plains States, to the northwest, its occurrence was of unusual interest in the Southeast as having been possibly the severest on record.

*Weather conditions.*—Significant changes in weather conditions, as observed at Louisiana State University, for April 11, 12, and 13 are tabulated below.

| Time | Wind | | Relative | | | Notes |
|---|---|---|---|---|---|---|
| | Direction | Velocity | Temperature | Humidity | Pressure | |
| | | *Miles per hour* | *°F.* | *Per-cent* | *Inches* | |
| *Apr. 11* | | | | | | |
| 3:00 p.m. | SE | 8 | 83.7 | >90 | 29.67 | |
| 4:15 p.m. | SW | 4 | 81 | | | |
| 6:20 p.m. | S | 6 | 77 | | | |
| 7:00 p.m. | SE | 6 | 75.5 | 77 | 29.830 | |
| 8:13 p.m. | E | 7 | 73 | | | |
| 8:47 p.m. | N | 25 | 68 | | | 0.15 inch rain in 3 minutes; very severe electrical storm. |
| 9:04 p.m. | Veer SW | 3 | 69 | | | 0.04 inch rain in 15 minutes, to end. |
| 9:32 p.m. | W | 3 | 69 | | | |
| 11:15 p.m. | N | 5 | 69 | 67 | | |
| *Apr. 12* | | | | | | |
| 7:00 a.m. | N | 11 | 57.0 | 43 | 29.970 | Dust storm lasting through day. |
| 2:00 p.m. | NW | 10 | 68.4 | <40 | | |
| 7:00 p.m. | NW | 5 | 60.5 | 46 | 29.900 | |
| *Apr. 13* | | | | | | |
| 7:00 a.m. | NW | 4 | 48.8 | 72 | 29.930 | |

During the afternoon of April 11, Baton Rouge was covered by warm, moist, *southerly* air. Rather sultry conditions were ameliorated to some extent by increased wind velocity and a sharp shower accompanying a severe electrical storm later in the evening. The temperature, however, rose slightly after the storm and remained constant until almost midnight, when, with wind from the north, it dropped gradually to a minimum of 56° F. at 6 a.m., on the 12th. Hygrograph and thermograph curves were strikingly parallel during the night, both rising slightly between the cessation of rain and 11:15 p.m. The arrival of a *cold front* was accompanied by a long period of backing wind, a pronounced squall and thunder storm, and, finally, a long period of veering wind. The relative humidity remained decidedly low throughout April 12, when *polar* air conditions were thoroughly established.

Rain had fallen in Baton Rouge on 5 days of the week preceding April 11, with an accumulated total of 1.8 inches. On April 10 none fell but the soil remained comparatively moist from a fall of 0.48 inch on the 9th. It therefore seems evident that very little dust of local origin could have entered the air by the 12th. The showers during the evening of the 11th should have prevented any raising of dust by accompanying squall-winds. The sky was exceptionally clear soon after the electrical storm. At sunrise, somewhat more than 6 hours after northerly winds had become established, the entire sky was overcast by dust and horizontal visibilities on ground level were reduced to "Fair" or "Indifferent." Though there were no very striking differences in visibility during the day, it was the local consensus of opinion that they were most reduced in the late afternoon and were rapidly improving toward sunset. Prominent objects were unidentifiable at a distance of 1 mile when visibility was at a minimum.

*Description of dust.*—Dust was collected at a height of approximately 50 feet above the ground on a vertically suspended damp cloth about 1 yard square. At frequent intervals, between 2 and 4 p.m., the cloth was rinsed in water, which was subsequently filtered in order that the residue could be subjected to petrographic examination by the junior author.

The material was found to be very fine, ranging in size of grains from colloidal dimensions up to almost 0.15 mm. The largest mineral grain was of muscovite mica and measured 0.085×0.04 mm. One quartz grain was almost as large, but most of the quartz was much smaller. About 50 percent of the material (by volume) was less than 0.005 mm in diameter, less than 5 percent over 0.025 mm, and the remainder between those dimensions. Many of the grains below 0.01 mm in diameter could not be determined with the equipment available. The substances recognized in the sample, therefore, were limited principally to the larger grains and were as follows:

*Approximate frequency (W) among grains larger than 0.01 mm in diameter*

| | |
|---|---|
| Volcanic glass | 56 |
| Quartz | 17 |
| Opaque grains, probably ashes and carbonaceous materials | 10 |
| Clay grains, mostly aggregates, in part weathered glass | 5 |
| Muscovite | 5 |
| Diatoms, several species, fresh-water types | 2 |
| Feldspars (undifferentiated) chiefly plagioclases | 1 |

*Less than 1 percent but fairly common*

Chlorite
Biotite
Microcline
Orthoclase
Hematite and limonite
Calcite, as aggregates and as cleavage fragments

*Rare*

Epidote, several grains
Zircon, 2 grains
Spherulites
Sponge spicules (?)
Titanite (?), one grain

The volcanic glass varies from colorless to brown, with a variety of shapes: irregular flat grains, curved fragments of bubble walls, grains including one or more bubbles, minute pumice fragments, and rod-shaped grains. Such shapes are typical of glass *shards*, blown from a volcano, and would hardly result from the weathering of glassy lavas. The largest grain of glass measured 0.14×0.098 mm. and a triple bubble 0.075×0.045 mm.

The highest percentage of volcanic glass does not necessarily mean that the dust came from an area where tuffs make up a large proportion of the surface outcrop. The relatively low specific gravity of the material and, especially, the shapes of the grains tend to concentrate glass fragments in finer dust, as heavier and more equidimensional grains settle out. Even a small percentage of volcanic glass in the soils from whence the dust originated would account for a high percentage of the material in dust drifted long distances.

The grains less than 0.005 mm in diameter apparently include less glass than the coarser sizes. Although the very finest material could not be definitely determined, it apparently consists largely of colloidal clay particles.

While the mineralogical analysis of the dust does not furnish a basis for the specific identification of the area of origin it strongly suggests, on the basis of rather uniformly very fine size and high percentage of volcanic glass, that the source was remote, and the direction of drift of the air mass which contained the dust points toward the Plains States as the source region.

# ANALYSIS OF THE PRECIPITATION OF RAINS AND SNOWS AT MOUNT VERNON, IOWA

By NICHOLAS KNIGHT

[Cornell College, Mount Vernon, Iowa, June 25, 1934]

In our work on the rains and snows for 1933–34, we treated 43 specimens of which 8 were snow and 35 were rain. The entire period was unusually dry. The precipitation for April was only one-eighth normal and some other months showed almost the same lack of moisture. The rain of May 9 was at the time of a heavy dust storm from the northwest and the bottom of the pans in which the water was collected for analysis was covered with a thick layer of black mud. There were a number of dust storms during the winter and spring. The rains of May and June, as a rule, were accompanied by severe thunder and lightning.

TABLE 1.—*Nitrogen and chlorine in rain and snow (parts per million)*

| Date | Precipitation in inches | | Chlorine | Free amm. | Alb. amm. | Nitrate | Nitrite | Sulphate $SO_3$ |
|---|---|---|---|---|---|---|---|---|
| | Rain | Snow | | | | | | |
| 1933 | | | | | | | | |
| June 22 | 0.5 | | 11.15 | 0.056 | 0.056 | | | |
| 23 | .45 | | 3.55 | .040 | .112 | | | |
| Sept. 24 | .25 | | 7.10 | .20 | .136 | | 0.001 | |
| 26 | 1.15 | | 7.10 | .32 | .112 | | .0014 | |
| Oct. 8 | .47 | | 7.10 | .272 | .16 | | .002 | |
| 10 | .2 | | 7.10 | | | | .0021 | |
| 15 | .25 | | 3.55 | .36 | .28 | | .012 | |
| 17 | .2 | | 7.10 | | | 0.2 | .0193 | |
| 21 | .2 | | 3.55 | .72 | .112 | .144 | .012 | |
| 26 | .42 | | 17.75 | | | .688 | .012 | 23 |
| Nov. 2 | .10 | | 3.55 | | | .176 | .155 | 15 |
| 5 | | 4 | 3.55 | .32 | .72 | .10 | .005 | 8 |
| 25 | | 1 | 17.75 | | | | | |

TABLE 1.—*Nitrogen and chlorine in rain and snow (parts per million)*—Continued

| Date | Precipitation in inches | | Chlorine | Free amm. | Alb. amm. | Nitrate | Nitrite | Sulphate $SO_3$ |
|---|---|---|---|---|---|---|---|---|
| | Rain | Snow | | | | | | |
| 1933 | | | | | | | | |
| Dec. 3 | 0.65 | | 2.13 | 0.02 | 0.28 | 0.06 | 0.0035 | 3.8 |
| 10 | | 2 | 3.55 | .28 | .16 | .078 | .005 | |
| 25 | | 4 | 1.42 | 1.12 | .056 | .062 | .0032 | 6 |
| 1934 | | | | | | | | |
| Jan. 4 | .5 | | .71 | .24 | .08 | .08 | .02 | 6.8 |
| 12 | .2 | | 3.55 | .32 | .045 | .18 | .014 | 7.6 |
| Feb. 16 | | 2 | 7.10 | .36 | .56 | | .0084 | |
| 18 | .4 | | 3.55 | .24 | .72 | | .0146 | 5 |
| 24 | | 3 | 11.15 | .72 | 1.2 | .12 | .006 | 14 |
| Mar. 2 | .2 | | .71 | .80 | .32 | .131 | .012 | 12 |
| 3 | .1 | | 3.55 | .05 | .85 | .13 | .0092 | 15 |
| 6 | .25 | | 1.42 | .04 | .72 | | .0092 | 10 |
| 9 | | 1 | 7.10 | | | .01 | .0071 | |
| 17 | .4 | | 3.55 | .40 | .36 | .192 | .19 | 10 |
| 23 | | 2 | 1.42 | .32 | .136 | .150 | .053 | |
| 30 | .1 | | 3.55 | | | .450 | .0258 | 50 |
| 30 | .2 | | 3.55 | | | .496 | .014 | 17 |
| Apr. 1 | .5 | | 3.55 | .16 | .36 | | .0121 | |
| 4 | .2 | | .71 | .48 | .16 | .12 | .01 | 28.5 |
| 26 | .12 | | 2.13 | | | .21 | .0017 | 10 |
| May 9 | .10 | | 10.65 | | | .3 | .02 | 10 |
| 13 | .6 | | 3.55 | .72 | .36 | .3 | .005 | |
| 21 | .12 | | 3.55 | 1.44 | 1.12 | .1 | .1 | 4.1 |
| 24 | .12 | | 3.55 | 1.80 | .64 | .01 | .02 | 0 |
| June 5 | .80 | | 10.65 | .36 | .32 | .20 | .025 | 0 |
| 6 | .50 | | 3.55 | .32 | .20 | .20 | .030 | 0 |
| 8 | 1.00 | | 3.55 | .08 | .36 | .20 | .035 | 0 |
| 9 | .15 | | 1.42 | .48 | .16 | .20 | .035 | 0 |
| 14 | .25 | | 2.13 | .42 | .136 | .2 | .38 | 0 |
| 17 | .08 | | .23 | | | .0018 | .004 | |
| 20, 22 | .65 | | 3.55 | .16 | .12 | .1 | .04 | 0 |